

# collage

A random collection of facts, opinions, and miscellany published from time to time by the editor of MOTOROLA'S ENGINEERING BULLETIN. Volume 2, No. 2... August, 1966



## MIDSUMMER MADNESS

(or summer camp in Arizona)

Actually it's too hot to sell you any Motorola things this month, so to temper your bitter disappointment, we've put together our very own trivia test. Everyone else seems to be doing it, and out here in Arizona we have to try even harder to prove we're as hip and citified as all our readers in Philadelphia, Midland, Council Bluffs and all those other a-go-go communities. So here goes:

1. When did Elijah Cook, Jr., invent the double-diode germanium rectifier? If he didn't, who is Elijah Cook, Jr., and did he ever invent anything?
2. Who is Hoacin Khalfi and why?
3. Who invented the electron? Where is it now?
4. How come a mirror reverses left and right but not up and down?
5. Movies—Who played Edison in "Steinmetz, The Boy"? Who played Mickey Rooney in "Spencer Tracy, The Man"? Who played W. V. Braun in "I Shoot For The Stars"?
6. Whatever became of Pierre Salinger? Is it true that he is now in charge of the executive fitness program at a large Western Aerospace firm?
7. Did Chester Gould or Doc Huer invent the LASER?

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The first person to send in all the right answers will be promptly turned over to our staff psychiatrist. Losers will receive an autographed picture of Fatty Arbuckle or Bob Muncrief

## Preview Department

Among other things, the next *Engineering Bulletin* will be zeroing in on satellite tracking systems and computer-aided, high-reliability circuit design, which makes a rather devastating parlay you'll have to admit. Also, we'll be bringing you a story that was to have run in the last issue of the *Bulletin* about electro-acoustic amplifiers but which didn't quite make it due, as they say, to circumstances beyond our control.

### Satellite Tracking

Last Spring, your peripatetic editor journeyed to Maryland to talk with scientists at the NASA/Goddard Space Flight Center about a tracking system we had developed for them known as the Goddard Range & Range Rate System. We learned a lot about how satellites are tracked and why, and we'll be passing it on to you along with our notes on the important work being done by Goddard's Tracking & Data System Directorate.

### Design For Reliability

Don Mark, one of the reliability experts at our Scottsdale Aerospace Center, will tell us how to use a computer to remove most of the glitches from your circuit design. With a case history or two, he'll show how circuits are designed for high reliability programs using a new mathematical model and some equations that will delight you as they relate performance capabilities to the circuit configuration. This could take all the intrigue out of trouble-shooting.

### Electro-Acoustic Amplifiers

If you read our "Preview Dept." last time out, you'll know all about this one. So, we'll add only that progress has been extremely good (probably accounting for the missed deadline), and that before too much longer these pint-sized devices will be moving out of the lab and into your microwave equipment. Better bone up before the state-of-the-art passes you by.

### R&D Trends

Featured this month will be some advice on how to bridge the gap between integrated logic and the conventional electro-mechanical relay. In it, author Dan Saewert tells of how a new integrated circuit was developed to interface between the logic elements and the relay.

### As Always

Dr. Noble will attempt to destroy a few of your pet illusions in his usual erudite manner and the "Volley" will bring you the latest news of Motorola Government Electronics Division.

# STUPENDOUS

## NEW PRODUCT ANNOUNCEMENT

Our Chicago people, in a frenzy of enthusiasm, have announced that they now have... ready to sell to you... "single-channel, all solid state, ultra-reliable receivers for ground/air communications." While they don't define their adjectival terms, we're inclined to believe the units are pretty good. They go on to say, "designated CM610 and CM620, the receivers operate in the VHF (108-180 mc) and UHF (225-400 mc) bands. Frequency is changed from the front panel by switching a plug-in crystal and using front panel adjustments."

Finally, they mention that "advanced design provides virtual elimination of pulse interference, 1.5 microvolt sensitivity, a minimum of 100 db image rejection, and excellent intermodulation and cross modulation characteristics." Most of the other measurable specs seem impressive, including the size, which is small (15 lbs., 3 1/2" x 9" in a 19" rack).

If you're in the market for these sorts of things, you could probably do worse than get more details from our Chicago Center.

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### GETTING THE WORD TO CONSTANTINOPLE

Our Microwave people seem to be coming up with one exotic project after another. Last time we told you about a system for the Navaho Indians out west. This time they struck paydirt in, of all places, Turkey. Under an Air Force contract they're supplying MC-50 Multiplex equipment for the Mediterranean Communications System (486L). It will be the longest single tropo-microwave system in the world, extending from central Spain to Eastern Turkey, most of the new sites will be in Turkey. The point of all this is that our solid-state, single sideband, suppressed carrier MC-50 multiplex equipment can speak many tongues (none of them forked) and is ready to travel in any direction. If you would like to plant a system in some even more wildly unusual location like, say, Perth-Amboy, drop a note to our Chicago Center and they'll be happy to send you descriptive literature.





## Forest D'Leigh m.s. (Or The Slipstick Jungle)

Chapter 3—Are Ethics More Important Than  
 \*\*\*\*\*Getting Along Nicely?\*\*\*\*\*

Last time, we left young, idealistic junior engineer Forest D'Leigh, ms, striding manfully toward the office of Project Engineer, R. A. "Crunch" Bradley. Bradley had assigned Forrest to write a paper for him (Bradley) to deliver at the next IEEE meeting. Forest considers this assignment a breach of professional ethics and will have none of it.

Forest strode purposefully through the maze of desks and drafting tables, his jaw set at a manly angle and his \$45.00 slide rule bouncing at his side. As he started to enter R. A. "Crunch" Bradley's office, he was blocked by a female leg thrust across the doorway. The leg belonged to Bradley's secretary, Fleur. She was eating an apple and reading a paperback novel with an illustration on the cover that caused Forest to quickly look away.

"What's the hurry, Forest?", she asked. "It's only two and Crunch is having lunch with Ace Heartley, ace salesman for Hotdog Electronic Distributors. I'm just catching up on my—er—reading."

"I've got to see Bradley," said Forest. "He said he wanted me just to 'clean up' a paper he's supposed to deliver, but he hasn't written a darned word of it. And besides, the title is 'How to replace engineers for fun and profit using computers, draftsmen and technicians'. I don't think he's joking, either, and I will have no part of it."

"Crunch'll be back around four, tiger," said Fleur, smiling. "Try him then. In the meantime, don't be too harsh on the guy. He wants your help, even though he'd never ask for it directly. He's very insecure. That's why he hired a bright young engineer like you. Why don't you go back to your desk and work on the paper and make something fine and meaningful out of it? Then you'd be helping both him and the proud engineering profession." "Golly," exclaimed Forest, "I never looked at it that way. If I do it the way you say I won't have to compromise my lofty ideals at all. You're a very perceptive young lady, Fleur, if I may call you that."

"You do that, Forest," she said, sweetly, while hook-shotting her apple core into the waste basket. "And why don't you drop by my pad tonight after work? Maybe I can give you a few more ideas for that paper." She handed him a matchbook cover on which she had written her address.

"I'll do just that," cried Forest joyfully, "And thanks again." With courage and confidence renewed Forest returned to his desk and began writing furiously. He changed the title to, "How to free engineers for creative engineering by making optimum use of computers and non-engineering personnel." At close to five o'clock he again approached Bradley's office. Forest entered Bradley's office. Bradley appeared to be deep in concentration, and at desk-top level his neck glowed redder than usual. Forest became aware of the smell of burning flesh. He glanced down and saw that a cigarette in Bradley's hand had burned all the way down through his fingers.

Delicately, Forest cleared his throat, and Bradley snapped to a sitting position.

"Yeah, Deelee, what's your problem?" he asked.

"Well, uh, sir...I just wanted to tell you I've been working on your paper, and its shaping up pretty good."



"That's my boy. I knew you had't inyuh."

"Well, that's about all I had in mind. I'll get back to you later. And...uh...you might rub a little butter on those fingers. That's what mom always did."

Bradley looked at his charred fingers. "Howinhell'd I do that? Musta been checking circuits out on the floor, eh?"

"Probably," said Forest, tactfully. "Well, see you anon."

Forest started to leave, but was halted by a piercing "Oh my God" from Bradley, who had just noticed a carbon copy of an order made out to Hotdog Electronic Distributors and its' ace salesman, Ace Heartley, his luncheon host.

"Hey, Deelee, I gotta project for you," he screamed. "Tomorrow morning we're getting...uh...35 Glickman pots, 15 Scorns trimmers, 250 Roschild integrated circuits of one sort or another, and 60 Botsch connectors. I want you to pick them up, tak'em somewhere, and DESIGN SOMETHING! And make it something useful, while you're at it."

Forest was nearly overcome with joy and gratitude. Tears welled up in his eyes. "Oh, thank you, sir. Your recruiting ads were right. You have given me a challenging and exciting engineering opportunity."

"You bet your sweet life, I have," smiled Bradley in a rather sinister way. "But, you'll need some help, kid; you can borrow a few technicians and draftsmen. Take Morrie Cohen, Ben Gennaro, Rosa Fernandez, Mike O'Reilly, Lars Svenson, Grace Chun and Le Roi Johnson."

"Golly," chortled Forest D'Leigh, ms, softly to himself. "CMSSAT is truly an equal opportunity (MF) employer."

With joy in his heart and confidence in his soul, Forest returned to his desk.

"And," he thought, looking at the matchbook cover with Fleur's address, "Tonight, I'll have the chance to tell Fleur about my great good fortune. I can hardly wait."

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Be sure to read chapter 4: Behind every successful young engineer is the support of a good woman.



## The doves make inroads

By the time this gets to you, our name will have been changed from Motorola Military Electronics Division to Motorola Government Electronics Division. This may not sound like much of a change to you, but it does go to show that not necessarily all the stuff we make is necessarily warlike. We make lots of scientific-oriented systems for NASA and people like that, so we felt our name ought to reflect it. You can't quibble with that, can you?

Also, since we were in a name-changing mood, we decided to change the name of our Western Center to Aerospace Center. All this really does is de-emphasize location and emphasize function.

Most companies would take four-color spread in Fortune to announce these monumental name changes, but we felt this is adequate. Actually, you can call us anything you want, but just send the contract.

(Nervous editor's note: If we're not making proper sport of these two name changes, please sympathize with us. You can imagine the top management man-hours that went into these decisions, and if you were in our spot and valued your job even a little bit, you'd be careful, too.)



## TODAY'S ETHNIC PUN

Our proposed sign for an antique carriage in Williamsburg or someplace like that: "George Washington Schlepped Here"



or, the editor speaks his mind, mindlessly



## here's ink in your eye

We have been rather fortunate in seeing some of the glorious products of Motorola getting a considerable amount of "ink" in some of the more important trade magazines (we define "important" as any magazine that writes about us). Anyway, we've had reprints made of the following articles and you could do a whole lot worse than writing us and asking for copies. If nothing else, it will give the engineers who either wrote the articles or worked on the projects a warm inner glow.

1. Design Efficient Multipliers With Step-Recovery Diodes—*ED*, Feb. 1, 1966.
2. Mowhawk Helps Confirm Army Air Concept—*Aviation Week*, February 28, 1966.
3. Designing Microcircuits with Multipurpose Chips—*Electronics*, March 21, 1966.
4. Analog Applications of Microelectronics—*Electronic Industries*, April, 1966.
5. Electroacoustic Amplifiers ("Bulk Effect")—*ED*, April 12, 1966.
6. AN/UPD-2 Radar Surveillance System—*Army*, May, 1966.
7. Real-Time Tracking Data Concept Pushed—*Aviation Week*, May 23, 1966.
8. An X-band Strip Transmission Line Tunnel Diode Amplifier—*The Microwave Journal*, May, 1966.



It's almost WESCON time again, not to mention a variety of other trade shows and technical conferences. Last year, as part of our campaign to defend the sacred American right of freedom of association (trade show-wise) we waxed poetically on the advantages inherent in exhibiting at trade shows. This time, we'd like to help those of you who are fortunate enough to deliver technical papers at WESCON, or any other place. You have that rare opportunity to make a name for yourself among your colleagues (or those with whom you would like to become colleagues). But there are pitfalls. And unless you follow a few simple rules, you will not only alienate everyone at the conference, you will bring shame to the company, agency, or university you represent (not to mention making a complete ass out of yourself). The following rules were put together only after a careful analysis of thousands of presentations observed by your bleary-eyed old editor, and are hereby presented as a public service by COLLAGE, always the friend of status-seeking engineers and scientists.

1. *Learn to drawl.* It doesn't matter which kind, Texas-type, Ivy League, but the slow, lengthened tone somehow commands more attention, even when it sacrifices something to intelligibility. A number of successful practitioners in public affairs can be cited and used as a guide.
2. *Use visual aids—properly.* Make sure your slides are made from copies of wrinkled Polaroid prints. They must be shown at least one paragraph after your references to them. If you get a sympathetic projectionist, you can be sure at least half will be shown upside down. This is a definite advantage. Otherwise they will think you are some kind of P.R. guy and not take your work seriously.
3. *Make references creatively.* That is, use names no one can be assumed to know. For instance, you might say something like, "Dr. Helmut Dantine made a few groping, abortive attempts in this field, but not until I revised the Karo-Kann technique was I able to establish conclusively that..."



4. *Work on your diction.* Proper inflection alone will not assure the success of your presentation. You must strive to be completely unintelligible. A clearly enunciated presentation establishes you as a marketing type, or even worse, one who has taken a Dale Carnegie course. Can you imagine a Steinmetz at a Toastmaster dinner?

5. *Learn the art of false climaxes.* The easiest way is to put a "Finally, I'd like to say..." up in the first quarter of your talk. Under no circumstances should you put "In conclusion..." further down than the middle of your talk.

6. *Run overtime.* This is a corollary of the false climax. Find out who follows you on the program and tell him he'd better be ready to go on a half-hour early; then let him squirm as you eat into at least half of his time. This is particularly effective if the talk following yours is scheduled just before lunch, or is the last talk of the day. It's always fun to watch people walking out on the next guy's talk, and it makes it appear as if he, not you, is the guilty one.

7. *Master the technique of microphone fumbling.* Fool with it for at least 10 minutes before you start your paper. Pretend you don't know it's working and tap and twist at it throughout your talk. Keep asking if you can be heard. Learn the technique of the ear-splitting feedback. Or, conversely, say that you don't need one of those clumsy things, and speak in a monotone from a corner of the stage.

8. *Change your topic.* Watch the show management laugh when you say something like "although my paper was scheduled to concern superconductivity, I will talk to you today about my views on Moral Disarmament."

9. *Shuffle your notes.* Literally, I mean. If you work from 3 x 5 cards, drop them on the floor and reassemble them in a random manner. This approach has produced true breakthroughs in the art of communications.

10. *Mind your appearance.* If you don't have time to grow a beard, rent one. If you're in L.A. for WESCON, this should be no problem. Also, there are plenty of costume rental firms that can attire you properly. However, Levis, a black turtle-necked sweater, a brown corduroy sportcoat with elbow patches, and dirty white sneakers are satisfactory raiment, especially if you are, or would like to appear to be, a PhD. A pipe that must be relighted every 4-5 minutes is optional, but effective.

Well, I could go on forever, but you get the idea. The important thing to remember is that a professionally-delivered paper establishes one as a fraud, professionally speaking. If you want to be known and recognized as a true leader in the forefront of your particular discipline, simply follow the rules outlined above and improvise a few of your own. Then watch the job offers come in!



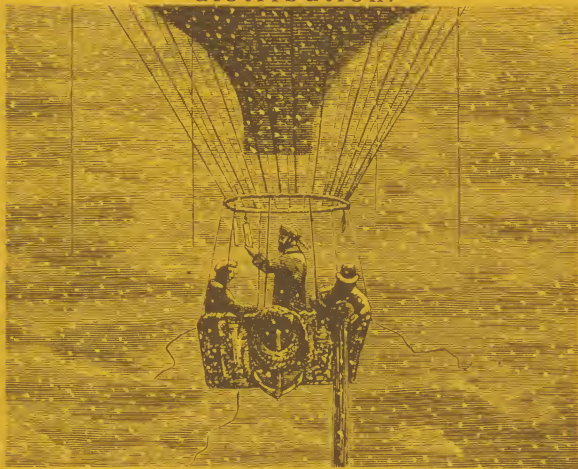
## PROFOUND APOLOGY

To those of you...and there were many...who found it difficult to read the last COLLAGE because of the odd colors and the printing of words on top of illustrations, we offer our apologies. Those of you who can prove you suffered severe eyestrain may write to us for a complimentary jug of boric acid. That is, you can write, but don't hold your breath waiting for it.



## To the moon and back with MOTOROLA

From time to time we've been telling you about the various things we've been doing as part of the Apollo Mission. Well, now we've put it altogether in a handsome, 32-page document. This tells the whole Apollo story to-date, and strangely enough, lingers lovingly over the Motorola contributions. However, even if you don't care a fig about Motorola, you'd like having the brochure because the illustrations are truly outstanding, and once you've read it you'll probably know enough about the entire Apollo mission to make people think you're James Webb. You can get your copy by writing to our Scottsdale address, but don't order more than you need. They're too expensive for random distribution.



## How great is our Hardware Dept.

Although we know of no one in this business who doesn't have a rightful claim to a reasonably good reliability record, we like to think that Motorola things are even more reliable than most. One reason, of course, is that once our gear is in orbit, no one is likely to get at it with a screwdriver. But anyway, we've put together an absolutely astounding brochure on the reliability of Motorola equipment. It is a heartwarming saga, beginning with our old WW II Walkie Talkie, right up to our present-day Apollo things. It is printed on thick, shiny paper, and fully-illustrated with pictures of the moon, Mars, and our guys building reliability into our hardware. If you'd like your very own copy, write to Aerospace Center (nee Western Center) in Scottsdale.

## Who Said It Dept..

"But if these machines were ingenious, what shall we think of the calculating machine of Mr. Babbage? What shall we think of an engine of wood and metal which can not only compute astronomical and navigation tables to any given extent, but render the exactitude of its operations mathematically certain through its power of correcting its possible errors? What shall we think of a machine which can not only accomplish all this, but actually print off its elaborate results, when obtained, without the slightest intervention of the intellect of man?"



**little RIC is small but  
OH-MY!**

If we had made RIC a few years ago, using old-fashioned transistors and other archaic devices, it would have filled up at least three standard six-foot relay racks, without even room for your lunch or an old pair of sweat socks. Now, however, RIC occupies only  $\frac{3}{4}$  of a cubic foot and weighs a scant 38 pounds. Unless you happen to be in the trucking or rack business, you'll have to admit this is progress.

And if you're dying to know what a RIC is, it's a microelectronic Radar Intercept Calculator. It contains 2800 DTL flat packs, 150 MOS-shift registers, which is equivalent to about 12,000 discrete functions. We designed the thing for USAF's Rome Air Development Center and it is basically a real time radar data processor that interfaces with a PPI radar display. It can be used in directing interceptors against as many as five targets—simultaneously.

By now, a brochure on RIC should be finished, and you can get a copy by writing to our Chicago Center.

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The Virginia Messenger, 1836  
The Miscellaneous Essays of Edgar Allan Poe, published in



# and yet more pity for the Freudian Working Girl



We are still receiving carloads of those supposedly accidental typing errors made by secretaries who have tried to translate the handwritten or verbal gibberish promulgated by engineer-guys. As usual, most of them are unprintable. Also, we must renege on our offer to send you a copy of the Motorola purchase order which requested Schmitt Triggers in a way that can, in an understated way, be called somewhat unusual. Our mail room supervisor, a swinging sort himself, is fearful of the consequences the humorless Postal Department may inflict upon him. "Remember Ginsberg" is now stenciled neatly above his desk. Anyway, here are a couple more of the printable kind:

As typed

3 volts are a mess

1st try face modulation

2nd try Fay's modulation

100 Wart RF Amplifier



As intended

3 volts RMS

Phase modulation

100 Watt RF Amplifier

Please send more...eventually we may publish them as an anthology. We're already talking to Grove Press with the hope it will be a complete unexpurgated version. And let them worry about the postal regulations.



## PENS, POISONS & OTHERWISE DEPT.

More notes from the editor's insane mail bag:

...MY DAUGHTER

S. Braude—"...I want it (COLLAGE) for my daughter who is getting her PhD in English Literature." (Ed. note: Her thesis is probably on how big company advertising types ruin the English language)

~~~~~

...THAT COLOR

L. Ragan—"Is it always printed in *that* color?" (Not no more, L.)

~~~~~

...FEATHER STUCK

J. McGrady—"Please include my nom de plume (feather stuck somewhere) on your mailing list." (Not till you tell us where it's stuck)

~~~~~

...CANCEL MY SUBSCRIPTION

E. Kaufman—"I promise to cancel my subscription to TIME, since I bought it on time." (take *that* Mr. Luce)

~~~~~

...UNDERCOMPENSATED SECRETARY

P. Plocher—"This is not typed because our over-worked, undercompensated secretary says she's too busy."

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...AGAINST THE LAW

L. Daniels—"Is it against the law to send some examples of the unprintable engineering typo errors? They'd make for a few laughs during some dull lunch hours among 'the girls'". (Love to, L., but see story farther back)

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# WESCON '66



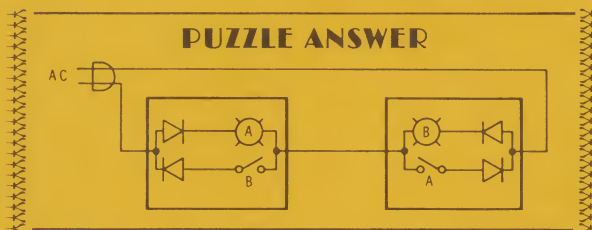
Before you run out of time on that busy WESCON agenda, be sure to check off Technical Session #15 as a must for 10:00 a.m. on Thursday, August 23. That's the one on "Engineering Education for Student and Professional", and you'd better get to the Biltmore Hotel in plenty of time because, from all indications, the SRO sign will be up shortly after the doors open. It's not hard to see why when you take a look at the all-star lineup of panelists. Session Chairman is Dean Joseph M. Pettit of Stanford University; panel members include Dr. Frederick E. Terman, President Thomas F. Jones of the University of South Carolina and Dr. F. K. Willenbrock of Harvard to represent the academic side of the picture. Then there is Dr. Robert E. Samuelson of Motorola's Government Electronics Division and Dr. R. W. Kulterman of the IBM Corporation to hold up industry's part in the overall effort to keep you engineers abreast of technological developments. Session Organizer is Motorola's John F. Byrne, director of research and development for the Government Electronics Division and an accomplished devil's advocate.

Incidentally, should you wish to pursue the subject of Technical Papers further, you might refer to the Wescon Issue of IEEE's Grid-Bulletin for a few pithy comments by your old editor.

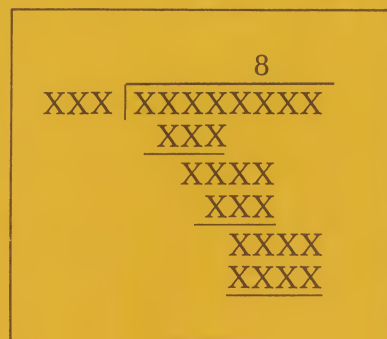
Another item of interest at WESCON, this time at the Sports Arena Exhibit Area, is Motorola Semiconductor Products Division's Integrated Circuit Applications Suite. Located on the upper level in Room C-1, you'll find, among other applications, representative elements of our Digital Test Command System (DTCS) which were described in the last issue of the *Engineering Bulletin*. This you will recall, is the system which includes several thousand integrated logic circuits and which we delivered to North American Aviation for use in the Apollo Acceptance Checkout Equipment. Other timely examples of integrated circuit applications will also be displayed.

# PUZZLE OF THE MONTH

To those of you who took the time to write us nasty letters about the simplicity of last time's "black box" puzzle, we say fie on you! The puzzle before that (the census taker) evoked an opposite response...it was too hard. Many, many letters were received with the right answer to the black box puzzle, the almost unanimous choice using four semiconductor diodes and, for extra points, many of them specifying Motorola diodes. For this, our sister Semiconductor Products Division forwards its sincere thanks. For anyone still in doubt, a typical "diode" solution is shown below.



So, now try this one, and none of your lip, please:



All you have to do here is reconstruct the long division. The digits, as you see, have been replaced by X except in the quotient where they have been almost entirely omitted. The 8 is in the correct position above the line, making it the third digit in a five digit answer.



## PENS, POISONS & OTHERWISE DEPT.



More notes from the editor's insane mail bag:

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S. Braude—"...I want it (COLLAGE) for my daughter who is getting her PhD in English Literature." (Ed. note: Her thesis is probably on how big company advertising types ruin the English language)

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L. Daniels—"Is it against the law to send some examples of the unprintable engineering typo errors? They'd make for a few laughs during some dull lunch hours among 'the girls'". (Love to, L., but see story farther back)

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### ...DANDY

E. Shields—"Your Feb. issue makes a dandy valance for a small window, providing the room has a crazy color scheme to blend with it."

B. Stevens—"...attached solution took 11 seconds." (Bah !)

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### ...GLADIATOR

E. McCoy—"If a teacher is a tutor, is a P.R. man a gladiator?"

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### ...VOLUPTOUS

W. Sherman—"I am on tenterhooks! Will the voluptuous, slinky, Miss Fleur seduce D'L?"

That's all we have room for. But drop us a line and you, too, may have your words taken out of context and be held up to ridicule by your colleagues.

Till next time, when and if...

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## collage

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